THINK METRIC

The Dunlop Company Limited

Contents

Introduction

The United Kingdom is changing over to a METRIC SYSTEM of measurement.

H.M. Government, impressed with the case put to them by industry, announced the decision in May 1965. The Confederation of British Industries believed that the change would assist our overseas trade and promote greater efficiency in manufacturing.

The change to metric units has already started in industry and the retail trade will follow suit as soon as legislation permits. There is to be no "metrication day" of sudden change, but a gradual change, sector by sector, spread over several years. By 1975 the United Kingdom will be substantially metric.

SI Units

Those who are familiar with the metric system in use on the continent of Europe will find that some of the new units of metric measurement are different, e.g., quantities involving force units. These changes have been determined by an international committee in the interests of a coherent system suitable for modern technology. Most leading nations of the world have agreed to adopt the new system, known as System International (SI). The United Kingdom is the first nation to introduce SI.

Thinking in Metric

It is very necessary to learn to think in metric, avoiding conversion to familiar units as far as possible. The purpose of this booklet is to introduce the metric units and give some measure of their size in comparison with familiar objects and situations.

Metrication and The Dunlop Company

A companion booklet with this title has also been published which outlines the complex planning problems which face the company in changing over to the metric system. Details are given of the organisation which the Company has established to ensure that the change can be carried out with the minimum inconvenience and cost.

Origins of the Metric System

The idea of a decimal system of units was conceived by Simon Stevin (1548-1620) who also developed the even more important concept of decimal fractions. Decimal units were also considered in the early days of the French Académie des Sciences founded in 1666, but the adoption of the metric system as a practical measure was part of the general increase in administrative activity in Europe which followed the French Revolution. Advised by the scientists of his day, the statesman Talleyrand aimed at the establishment of an international decimal system of weights and measures 'à tous les temps, à tous les peuples'. It was based on the metre as the unit of length (it was intended to be one ten-millionth part of the distance from the North Pole to the equator at sea level through Paris, but the circumstances did not permit this aim to be achieved with any great accuracy) and the gramme as the unit of quantity of matter. The gramme was to be the mass of one cubic centimetre of water at 0 °C.

Although the metric system was primarily devised as a benefit to industry and commerce, physicists soon realized its advantages and it was adopted also in scientific and technical circles. In 1873 the British Association for the Advancement of Science selected the centimetre and the gramme as basic units of length and mass for physical purposes.

Measurement of other quantities called for a base-unit of time and the adoption of the second for this purpose gave the centimetre-gramme-second system (c.g.s.). In about 1900 practical measurements in metric units began to be based on the metre, the kilogramme and the second (the MKS system). In 1935, the International Electrotechnical Commission (IEC) accepted the recommendation of Professor Giorgi that this system of units of mechanics should be linked with the electro-magnetic units by the adoption of any one of the latter as a fourth base-unit. The ampere, the unit of electrical current, was adopted by the IEC in 1950 as the fourth base-unit, giving the MKSA (or Giorgi) system.

Since 1875 all international matters concerning the metric system have been the responsibility of the Conférence Générale des Poids et Mesures (CGPM) which was constituted following the Convention held in Paris in that year. The CGPM meets in Paris, and controls the

Comité International des Poids et Mesures (CIPM) and various Sub-committees as well as the Bureau International des Poids et Mesures (BPIM).

The laboratories of BIPM at Sèvres are the repository of the standard kilogramme and the former standard metre. The kilogramme is still defined in terms of the international prototype at Sèvres but the metre is now defined in terms of a number of wavelengths of a particular radiation of light. The United Kingdom participates in CGPM work, the Government department responsible being the Ministry of Technology.

At its tenth meeting, in 1954, the CGPM adopted a rationalized and coherent system of units based on the four MKSA units, the kelvin as the unit of temperature and the candela as the unit of luminous intensity. The eleventh CGPM in 1960 formally gave it the full title 'Système International d'Unités' for which the abbreviation is 'SI' in all languages.

World Map

Countries already using the metric system

4

Countries in process of changing

Non-metric countries

Decimals

The metric system is decimal (except for units of time and plane angle).

Quantities less than ONE are expressed in tenths, hundredths, thousandths and so on. The whole numbers are separated from the fractions by a decimal point. The point should generally be opposite the middle of the figure, but in typewritten and other documents produced on machines without a decimal point a full stop on the base line may be used.

To multiply or divide by 10, the decimal point is moved one place to the right (multiplication) or to the left (division).

To multiply or divide by 100, the decimal point is moved two places; by 1000 three places; and so on.

To facilitate reading long numbers, they should be separated into groups of three figures, counting left and right from the decimal point. A gap should be used to separate the groups, as shown in the examples below.

Unless there is a special reason for doing so, a sequence of four figures not broken by a decimal point, need not be separated into groups, e.g., 1000 or 0·0002.

$$\begin{aligned}
\mathbf{123{\cdot}456} \times \mathbf{10} &= \mathbf{1\,234{\cdot}56} \\
\times \mathbf{100} &= \mathbf{12\,345{\cdot}6} \\
\times \mathbf{1000} &= \mathbf{123\,456} \\
\div \mathbf{10} &= \mathbf{12{\cdot}345\,6} \\
\div \mathbf{100} &= \mathbf{1{\cdot}234\,56} \\
\div \mathbf{1000} &= \mathbf{0{\cdot}123\,456}
\end{aligned}$$

Basic SI Units

There are six BASIC units from which other units are derived or defined.

measurement of	unit	symbol
length	metre	m
mass	kilogramme	kg
time	second	s
electric current	ampere	A
temperature (thermodynamic or absolute)	kelvin	K
luminous intensity	candela	cd

Examples of units which are derived or defined from basic units are

force	newton	N
energy	joule	J
power	watt	W

This booklet refers only to those units which will be of general use in industry. A more comprehensive list of SI units will be found in B.S.I. publication PD 5686.

Discipline of Notation

It is important when using the symbols in written or typed work that they correctly shown.

Capital letter symbols for units are used only when they represent proper names, e.g., capital A (ampere), K (kelvin), N (newton). The capital letter is NOT used when writing the name in full, except for Celsius.

In calculation and measurement singular units and symbols are correct, even when the quantity is greater than one, e.g., 12 m, NOT 12 ms; 24 kg, NOT 24 kgs.

Full stops are not used with symbols. A gap should be left between the number and the symbol, also between symbols where more than one are used, e.g., 1 J = 1 N m

Prefix symbols (see page 7) are written and typed immediately adjacent to the unit symbol, e.g., 36 MJ = 10 kW h

Prefixes for Units

The SI unit is often unsuitable because of the size of the number involved, so a system of prefixes is used. This gives a wide choice to suit any application.

Multiplication Factor

1 000 000 000 000	(10^{12})	tera	T
1 000 000 000	(10^{9})	giga	G
1 000 000	**(10^{6})**	**mega**	**M***
1 000	**(10^{3})**	**kilo**	**k***
100	(10^{2})	hecto	h
10	(10)	deca	da
1 SI UNIT			
0·1	(10^{-1})	deci	d
0·01	**(10^{-2})**	**centi**	**c***
0·001	**(10^{-3})**	**milli**	**m***
0·000 001	(10^{-6})	micro	µ
0·000 000 001	(10^{-9})	nano	n
0·000 000 000 001	(10^{-12})	pico	p
0·000 000 000 000 001	(10^{-15})	femto	f
0·000 000 000 000 000 001	(10^{-18})	atto	a

**General use will require only these*

In use these prefixes are combined with the basic and derived units to create units of different magnitude.

e.g., megagramme (Mg) kilogramme (kg)
kilometre (km) millimetre (mm)

It is important that capital letters are not used except where shown as mega could be confused with milli.

In writing reports and other technical communications it is often preferable to use only basic and derived SI units, using multiplying factors to the base 10 to avoid long numbers,

e.g., 6 mm would be written 6×10^{-3} m
36 MJ would be written 36×10^{6}J

Weight (Mass)

A significant change from the conventional metric system is the use of the term mass. This means the amount of material rather than the weight. It is important to understand the difference, since weight varies according to the pull of gravity and mass is always a constant. Gravity varies slightly over the surface of the earth and considerably within the universe. Mass will be measured by weighing against a known pull of gravity, or another known mass. For all practical purposes on earth they can be regarded as identical.

SI unit	Approved multiples and sub-multiples	Symbol
	megagramme or tonne**	Mg or t*
kilogramme		kg
	gramme	g
	milligramme	mg
	microgramme	μg

Units for general use will be

tonne for freight and solid fuel, etc.
kilogramme for everyday use.
gramme for scientific work and some retail sales.

** The correct pronunciation of the word "tonne" rhymes with "gone", but it is sometimes pronounced "tunny", to be certain of distinguishing it from the imperial ton.

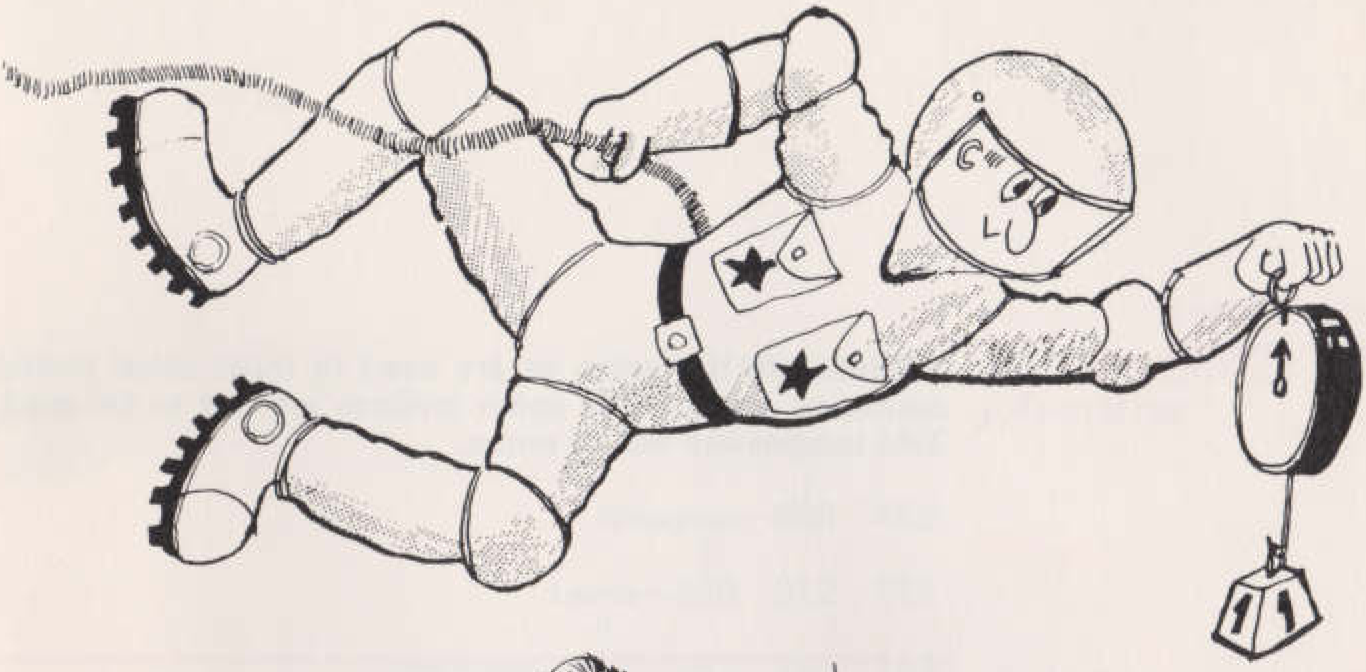
* For the same reason the full word spelling (tonne) is preferred to using the symbol 't' only.

1 g x 1000 = 1 kg
1 kg x 1000 = 1 Mg (tonne)

Equivalents

1 tonne = 0·984 imp. tons	1 imp. ton = 1·016 tonne
1 kg = 2·205 lbs.	1 lb. = 0·454 kg
1 g = 0·035 ozs.	1 oz. = 28·35 g

Weight (Mass)



In outer space a mass of 1 kg can have no weight at all.

In Paris, where the international prototype kilogramme is kept, a mass of 1 kg has a weight of 1 kg.

The average weight of a man is 70 kg (on earth).

Length

Metric Linear Measurements

These are the same as are used in most other metric countries, except that some prefixes are not to be used. This lessens the risk of errors.

SI unit	Approved multiples and sub-multiples	Symbol	NOT TO BE USED
	kilometre	km	
		dam	decametre
metre		m	
		dm	decimetre
	centimetre	cm	
	millimetre	mm	
	micrometre	μm	

Units for general use will be:

kilometre for road distances and map measurements.
metre for lengths generally between 1000 mm and 1 km.
centimetre for limited non-engineering use.
millimetre for engineering and general use below 2 m.

1 mm x 10 = 1 cm
1 cm x 100 = 1 m
1 m x 1000 = 1 km

Equivalents

1 km = 0·621 miles
1 m = 1·094 yards
1 mm = 0·0394 inches

1 mile = 1·609 km
1 yard = 0·914 m
1 inch = 25·4 mm

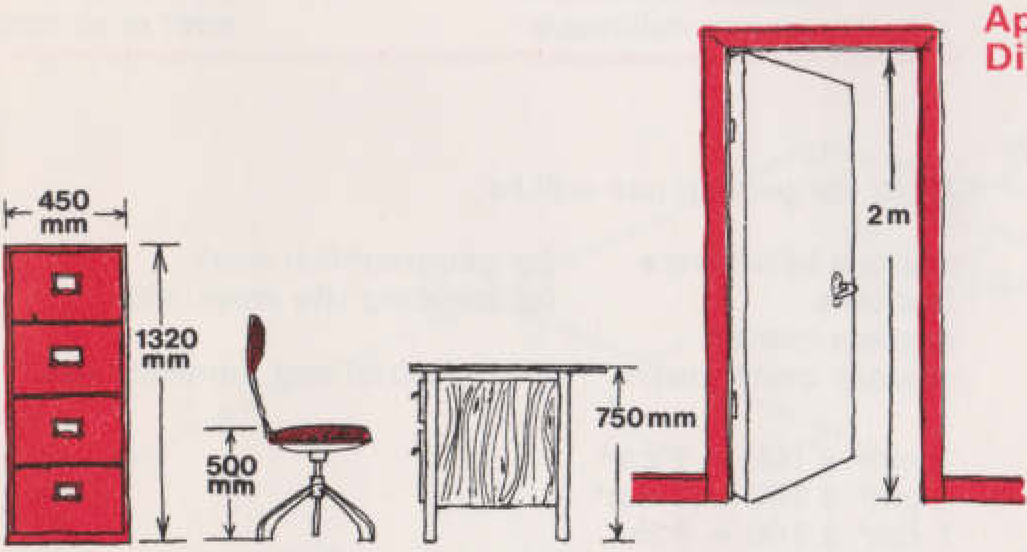
8 km	is approximately equivalent to	5 miles
1 m	is approximately equivalent to	40 inches
100 mm	is approximately equivalent to	4 inches

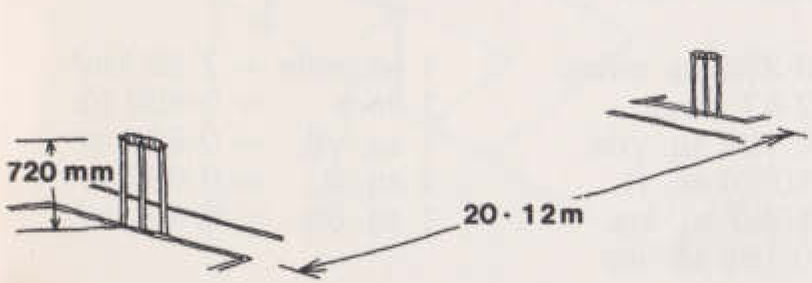
Length

Road Distances in Kilometres

	Cardiff	Newcastle-upon-Tyne	Manchester	Liverpool	Leeds	Glasgow	Bristol	Birmingham
Bristol								140
Glasgow							588	462
Leeds						338	312	175
Liverpool					117	341	258	145
Manchester				56	64	340	256	127
Newcastle-upon-Tyne			206	246	146	230	457	322
Cardiff		480	277	264	335	595	68	164
London	246	440	296	317	306	631	187	177

Approximate Dimensions





Area

Units of area are derived from the units of length. They are the same as those used in most other metric countries. The "are" and the "hectare" are established metric units of useful sizes between a square metre and a square kilometre.

SI unit	Approved multiples and sub-multiples	Other approved units	Symbol
	square kilometre		km^2 or sq km
		hectare	ha
		are	a
square metre			m^2 or sq m
	square decimetre		dm^2 or sq dm
	square centimetre		cm^2 or sq cm
	square millimetre		mm^2 or sq mm

Units for general use will be

square kilometre	for geographical work.
hectare	for building site areas, etc.
square metre	
square centimetre	for industrial and domestic use.

$1\ mm^2 \times 100 = 1\ cm^2$
$1\ cm^2 \times 100 = 1\ dm^2$
$1\ dm^2 \times 100 = 1\ m^2$
$1\ m^2 \times 100 = 1\ a$
$1\ a \times 100 = 1\ ha$
$1\ ha \times 100 = 1\ km^2$

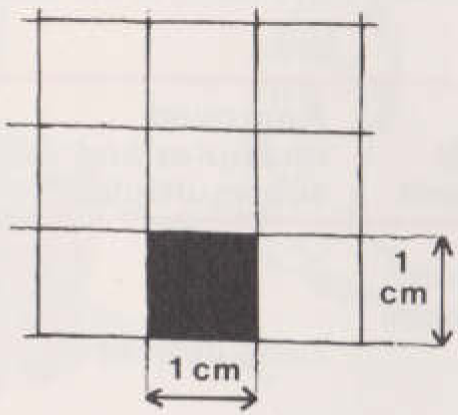
Equivalents

$1\ km^2 = 0{\cdot}386$ sq. miles
$1\ ha = 2{\cdot}47$ acres
$1\ m^2 = 1{\cdot}196$ sq. yds.
$1\ m^2 = 10{\cdot}76$ sq. ft.
$1\ m^2 = 1550$ sq. ins.
$1\ cm^2 = 0{\cdot}155$ sq. ins.

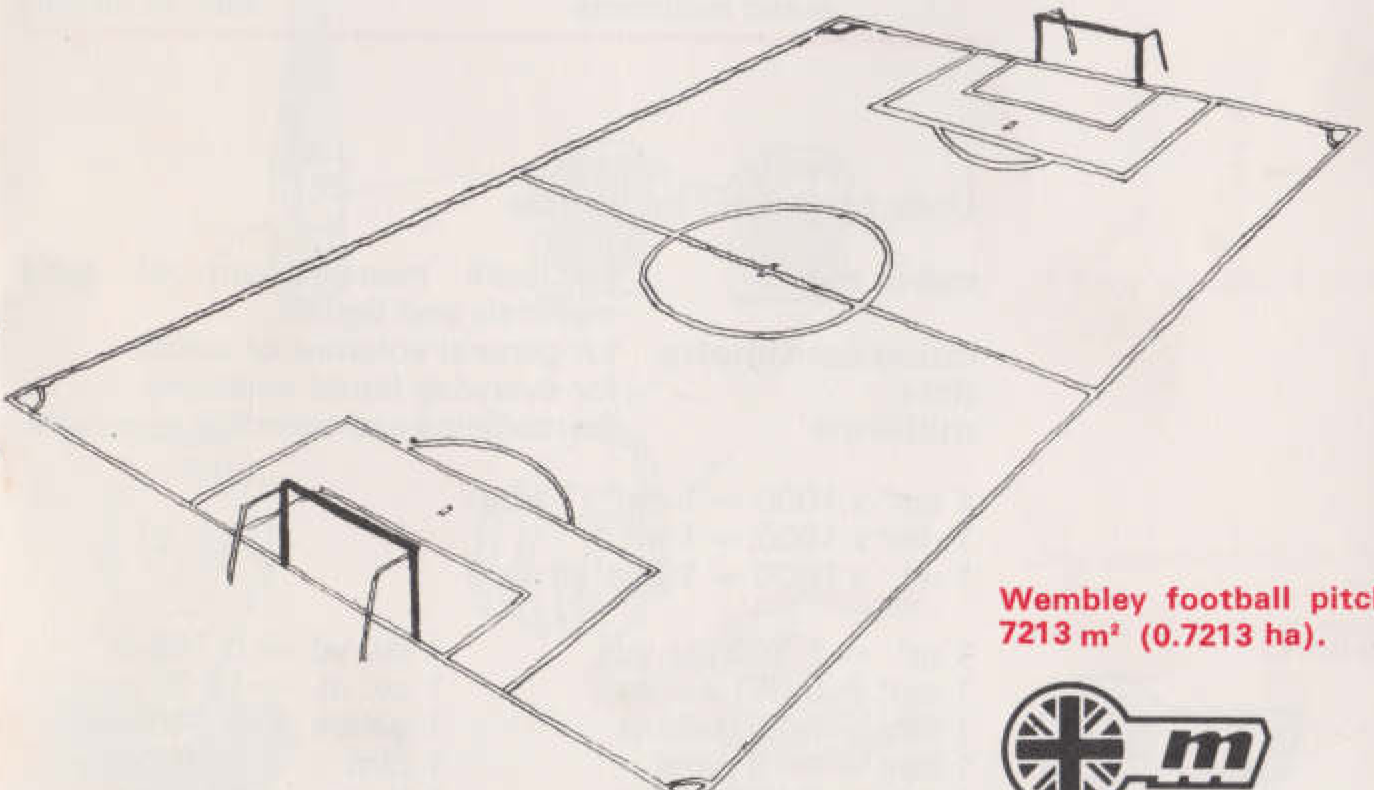
1 sq. mile $= 2{\cdot}59\ km^2$
1 acre $= 0{\cdot}405$ ha
1 sq. yd. $= 0{\cdot}836\ m^2$
1 sq. ft. $= 0{\cdot}093\ m^2$
1 sq. ins. $= 6{\cdot}45\ cm^2$

Area

This page is metric size A5. It has an area of 312·5 cm². 32 of these pages make a metric AO size of one sq. metre.



1 cm² (one square centimetre). 10 000 of these make 1 square metre.



Wembley football pitch 7213 m² (0.7213 ha).

Volume and Capacity

Units of volume are derived from the units of length. They are the same as those used in most other metric countries. The litre, already an established metric unit, is a special name for the cubic decimetre, and therefore the millilitre becomes a special name for the cubic centimetre.

Note: The symbol for the cubic centimetre is cm³, NOT c.c.

SI unit	Approved multiples and sub-multiples		Other approved units	Symbol
cubic metre				m^3 or cu m
	cubic decimetre	or	litre	dm^3, cu dm, or litre (*full word preferred*)
	cubic centimetre	or	millilitre	cm^3, cu cm, or ml
	cubic millimetre			mm^3 or cu mm

Units for general use will be

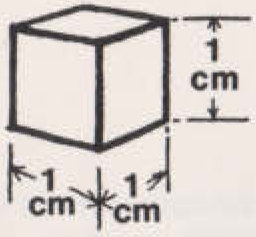
cubic metre	for bulk measurement of solid materials and liquids.
cubic centimetre	for general volumes of solids.
litre	for everyday liquid measures.
millilitre	for medicine and scientific measures.

1 cm^3 x 1000 = 1 dm^3 (1 litre)
1 dm^3 x 1000 = 1 m^3
1 ml x 1000 = 1 litre (1 dm^3)

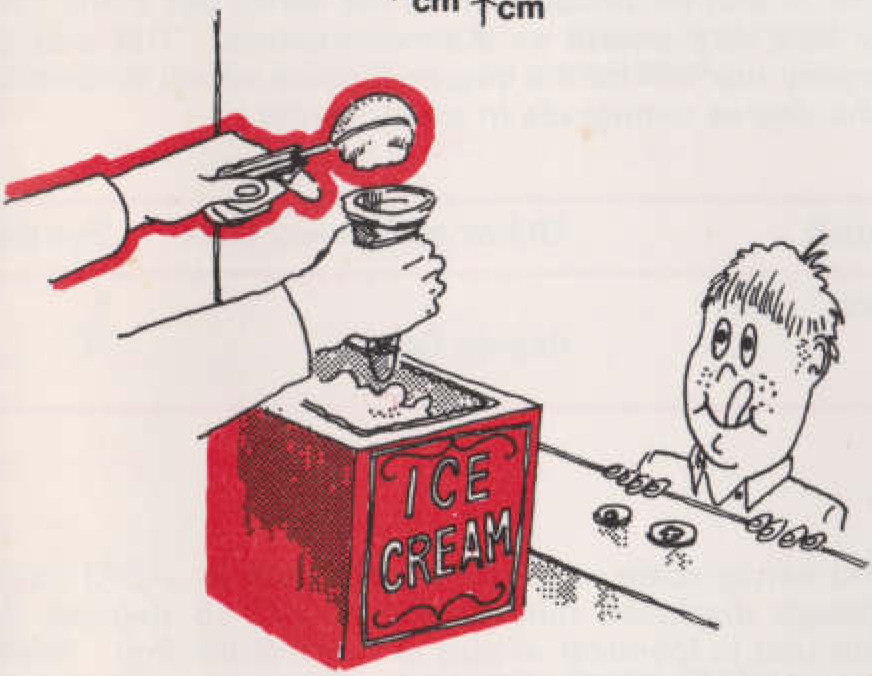
Equivalents

1 m^3 = 1·308 cu. yds.	1 cu. yd. = 0·765 m^3
1 cm^3 = 0·061 cu. ins.	1 cu. in. = 16·39 cm^3
1 litre = 0·22 gallons	1 gallon = 4·546 litre
1 litre = 1·76 pints	1 pint = 0·568 litre
1 ml = 0·035 fl. ozs.	1 fl. oz. = 28·4 ml

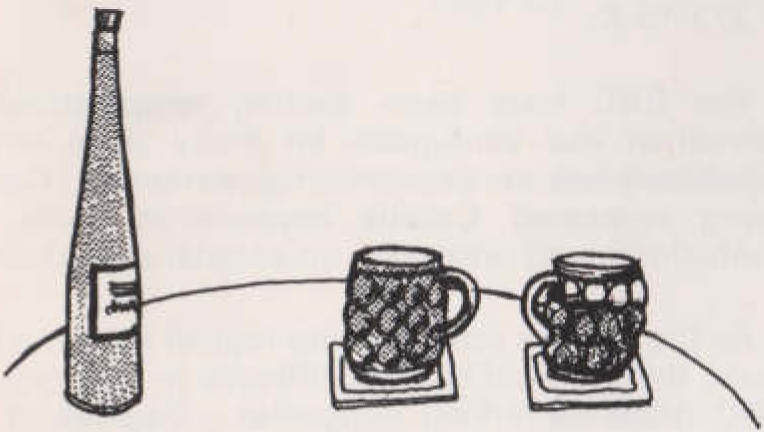
Volume and Capacity



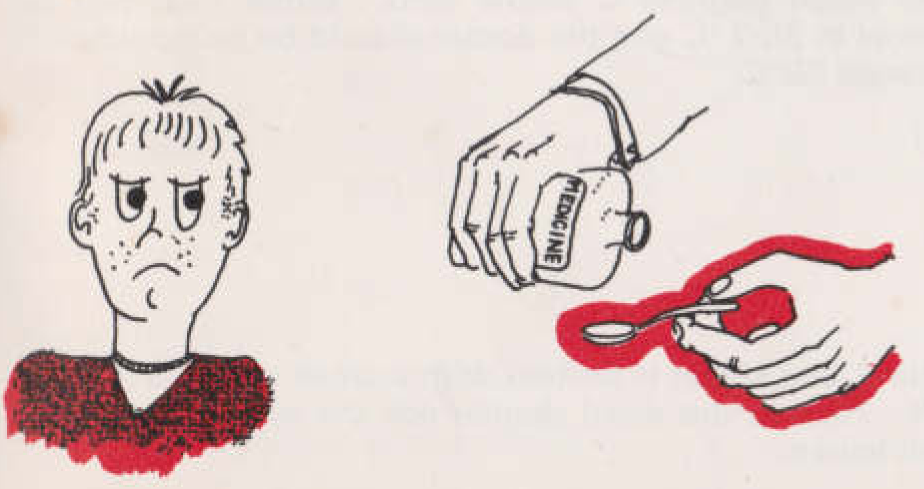
1 cm³ (one cubic centimetre). 1 000 000 of these make 1 cubic metre.



Popular ice cream scoops dispense about 80 cubic centimetres.



1 litre = $1\frac{3}{4}$ pints (approx.)



One standard medicinal teaspoon holds 5 millilitres or 5 cubic centimetres.

Temperature

The SI unit for temperature is the kelvin but it will have very little use except in thermodynamics. The unit for everyday use will be the degree Celsius which is identical to the degree centigrade in all but name.

SI unit	Other approved unit	Symbol
kelvin		K
	degree Celsius	°C

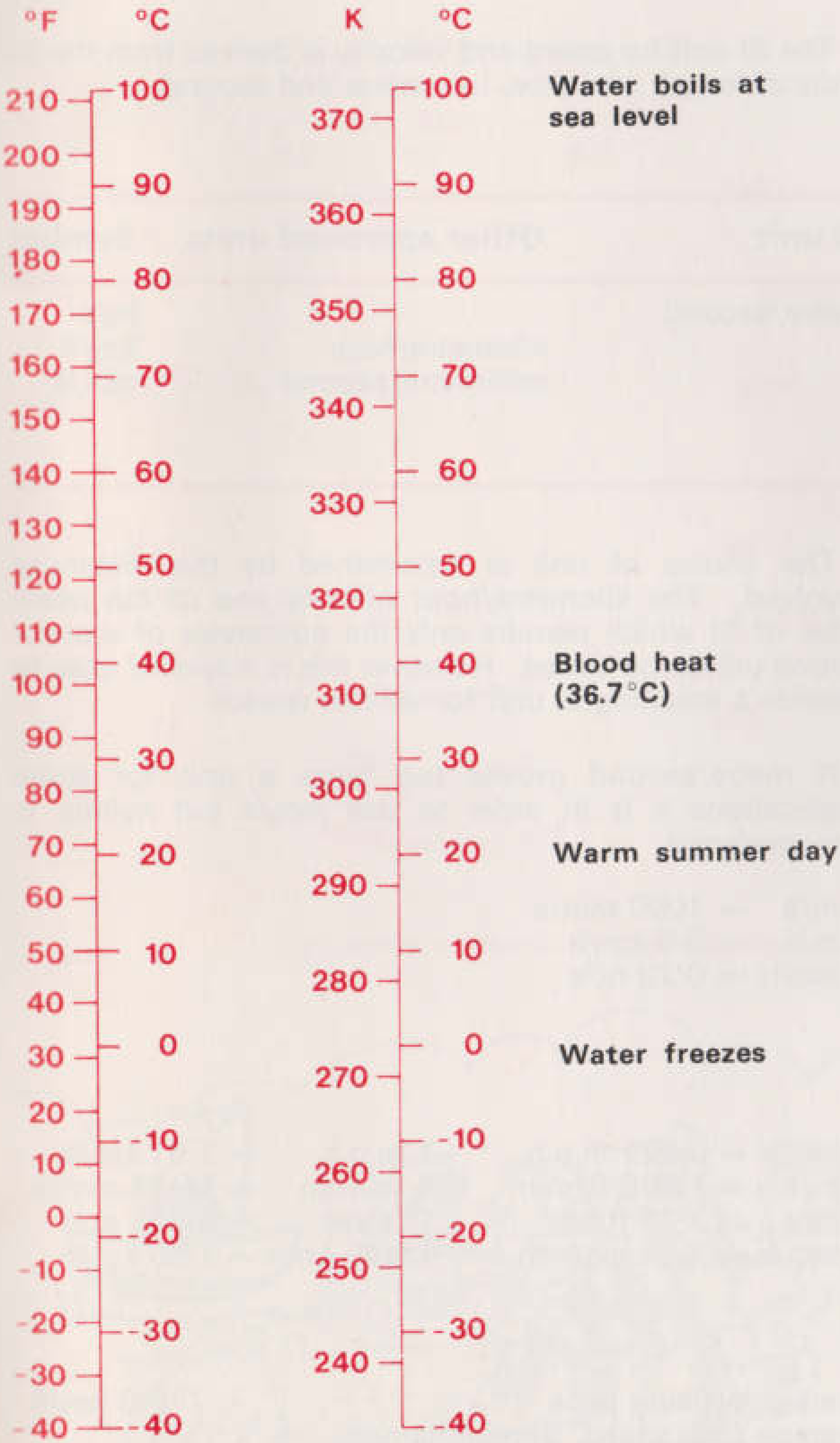
The kelvin scale is absolute with zero at —273·15 °C. Although displaced numerically by 273·15 degrees the kelvin unit is identical in size to the Celsius unit. Water boils at 100 °C which is 373·15 K and freezes at 0 °C which is 273·15 K.

The BBC have been quoting temperatures in both fahrenheit and centigrade for many years without any significant success in promoting centigrade. Centigrade is being re-named Celsius because in some countries confusion could arise with an angular measurement.

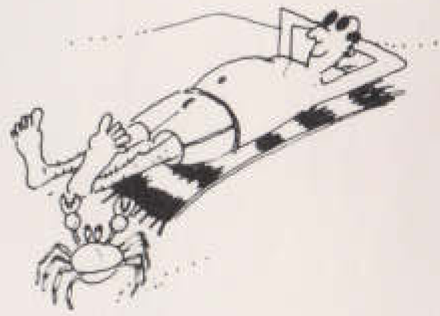
As the Celsius scale is more logical than the fahrenheit scale, there should be little difficulty in changing once the BBC drops fahrenheit altogether. Degrees of frost will then mean degrees C below zero. Blood heat will be normal at 36·7 °C and the doctor should be called when it exceeds 38 °C.

Note that kelvin is written with a small k but its symbol is K. Neither the word degree nor the symbol ° is used with kelvin.

Temperature



Temperature Scale Comparisons



Speed

The SI unit for speed and velocity is derived from the SI units of length and time, i.e., metre and second.

SI unit	Other approved units	Symbol
metre/second		m/s
	kilometre/hour	km/h
	millimetre/second	mm/s

The choice of unit is determined by the distances involved. The kilometre/hour offends one of the basic rules of SI which permits only the numerator of a compound unit to be varied. However this is a special case to provide a meaningful unit for vehicle speeds.

If metre/second proves too large a unit for some applications it is in order to use mm/s but m/min is non-preferred.

1 m/s = 1000 mm/s
1 m/s = 3·6 km/h
1 km/h = 0·28 m/s

Equivalents

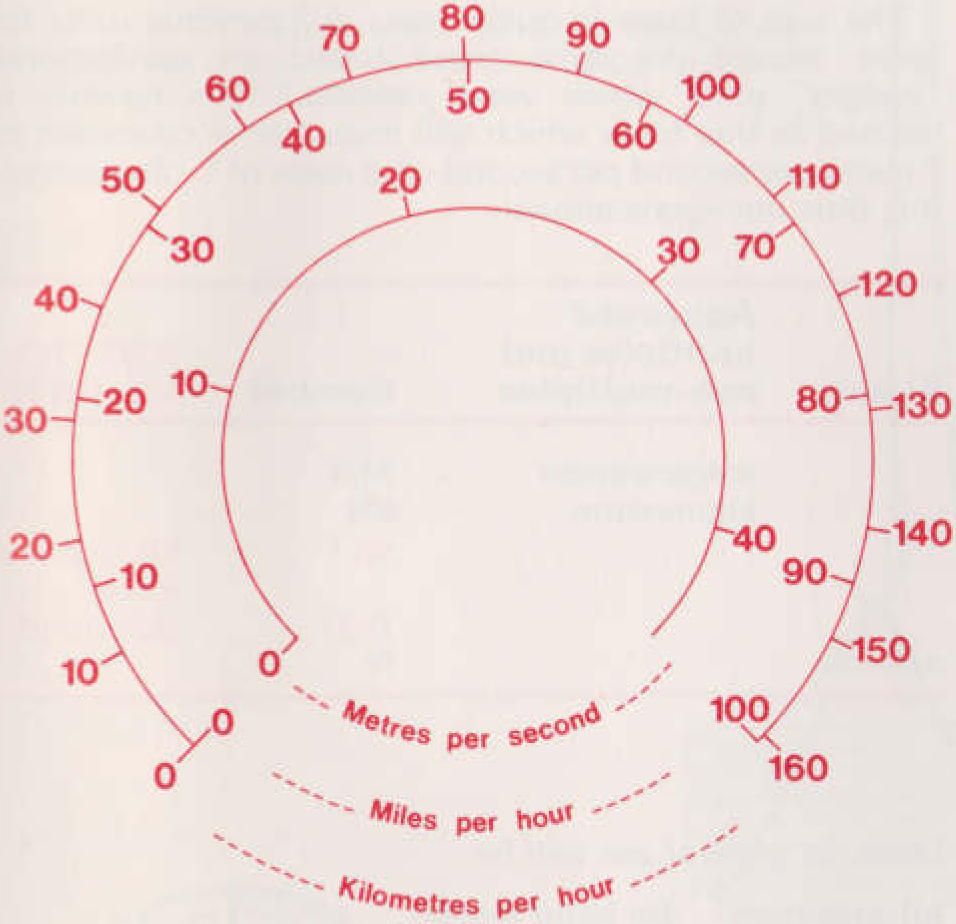
1 km/h = 0·621 m.p.h.
1 m/s = 196·8 ft/min
1 m/s = 3·28 ft/sec
1 mm/s = 2·36 ins/min

1 m.p.h. = 1·61 km/h
1 yd/min = 15·24 mm/s
1 ft/sec = 0·305 m/s
1 U.K. knot = 1·85 km/h

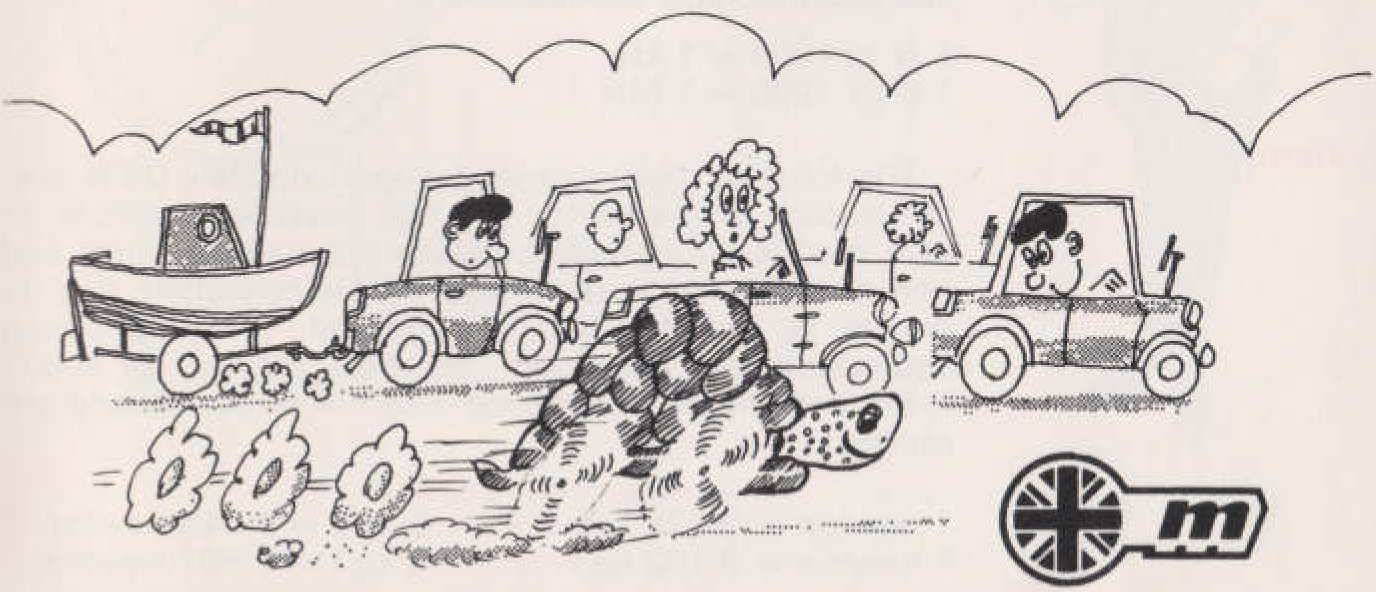
Familiar Speeds

average walking pace	6·0 km/h
average train speed, Birmingham to London (Euston)	120 km/h
Mach 1 (the speed of sound) at sea level	340 m/s

Speed



Comparison of Imperial and Metric Speeds



Force

The unit of force is quite new. All previous units for force, except the dyne, were based on gravitational "weight" units which were variable. The newton is defined as that force which will impart an acceleration of 1 metre per second per second on a mass of 1 kilogramme. It is thus non-gravitational.

SI unit	Approved multiples and sub-multiples	Symbol	NOT TO BE USED
	meganewton	MN	
	kilonewton	kN	
		kg f	kilogramme force
		(kp)	(kilopond)
newton		N	

Units for general use will be

kilonewton for large forces
newton for small forces

Units of force will generally be required only in scientific and technological applications.

1 N x 1000 = 1 kN
1 kN x 1000 = 1 MN

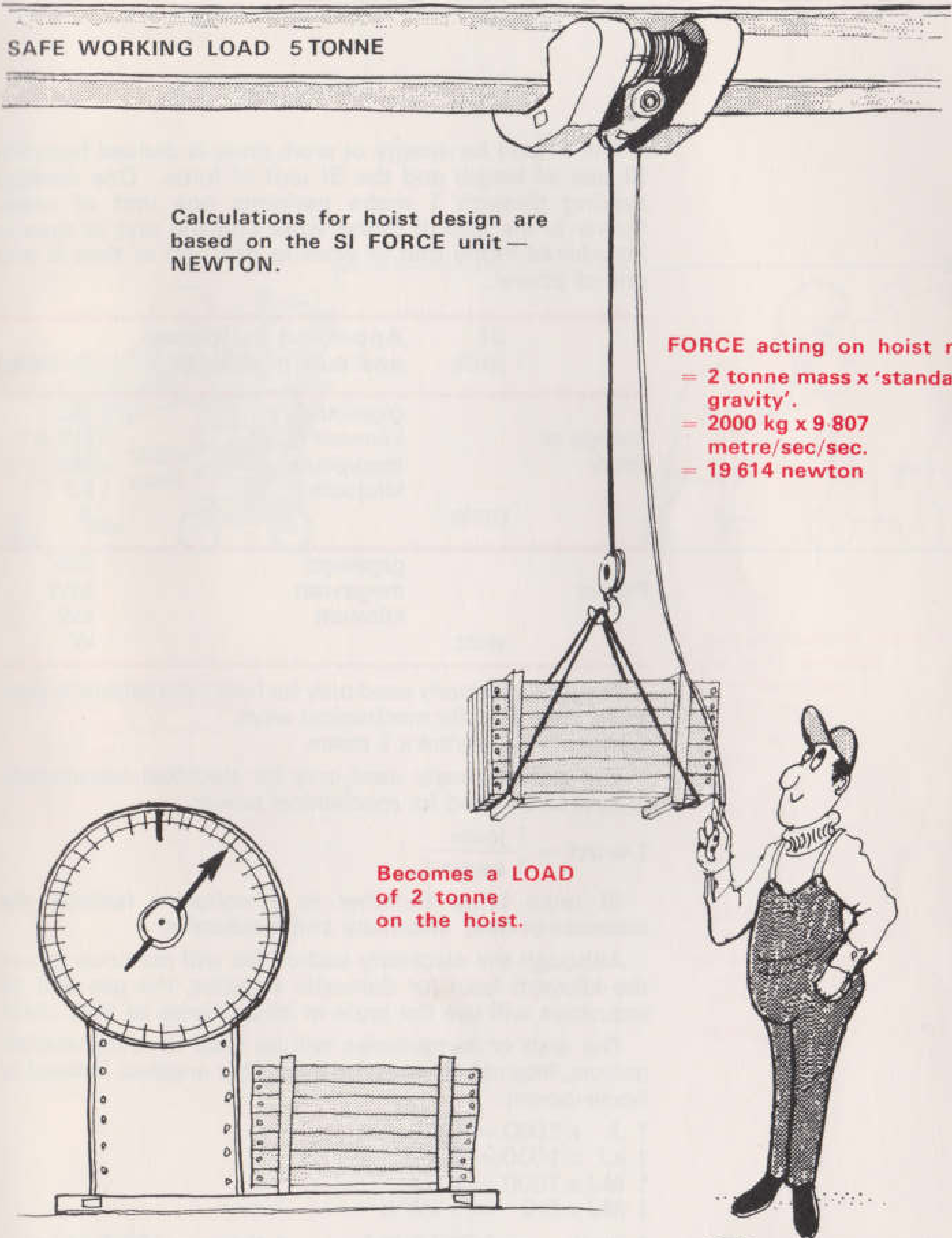
Equivalents

The force of gravity varies by approximately 0·5% over the surface of the earth. It is not possible, therefore, to give precise equivalents between gravitational units and non-gravitational units unless the acceleration due to gravity at that location is specified. The following equivalents are based on "standard gravity" of 9·807 metre per second per second (32·174 ft. per second per second).

1 newton = 0·225 lb f
1 newton = 0·102 kg f

1 lb f = 4·448 newton
1 kg f = 9·807 newton

Force, Load and Mass



Energy, Work and Power

The SI unit for energy or work done is derived from the SI unit of length and the SI unit of force. One newton moving through 1 metre performs one unit of work. Power is the rate of doing work and the unit of time is introduced. One unit of work in one unit of time is one unit of power.

	SI unit	Approved multiples and sub-multiples	Symbol
Energy or Work		gigajoule	GJ
		kilowatt hour	kW h
		megajoule	MJ
		kilojoule	kJ
	joule		J
Power		gigawatt	GW
		megawatt	MW
		kilowatt	kW
	watt		W

The joule, formerly used only for heat calculations is now to be used also for mechanical work.

1 joule = 1 newton x 1 metre

The watt, formerly used only for electrical calculations is now to be used for mechanical power.

$$\textbf{1 watt} = \frac{1 \text{ joule}}{1 \text{ second}}$$

SI units bring together in a coherent fashion the sciences of heat, electricity and mechanics.

Although the electricity authorities will continue to use the kilowatt hour for domestic supplies, the gas and oil industries will use the joule or its multiples as heat units.

The watt or its multiples will be used in rating electric motors, internal combustion and other engines, instead of horse-power.

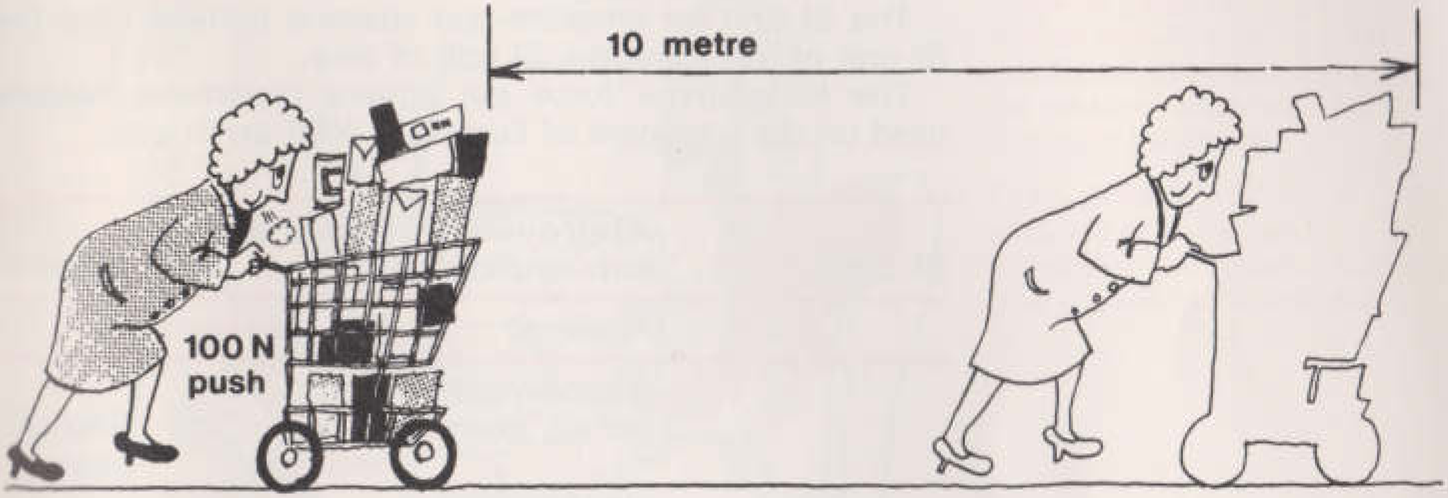
1 J x 1000 = 1 kJ
1 kJ x 1000 = 1 MJ
1 MJ x 1000 = 1 GJ
1 MJ x 3·6 = 1 kW h

Equivalents

1 joule = 0·737 ft.lb f
1 watt = 44·25 ft.lb f/min.
1 kilowatt = 1·34 h.p.

1 therm = 105·5 MJ
1 Btu = 1055 J
1 ft.lb f. = 1·36 J
1 h.p. = 746 W

Energy, Work and Power



In the example above a truck is pushed a distance of 10 metres. It requires a force of 100 newtons.

Work Done
= Force x Distance
= 100 x 10
= 1000 joule or 1 kilojoule

If this amount of work is done in 10 seconds
Power Required

$$= \frac{\text{Work Done}}{\text{Time}} = \frac{1000}{10} = 100 \text{ watt}$$

If the same amount of work is done in 5 seconds
Power Required

$$= \frac{1000}{5} = 200 \text{ watt}$$

Pressure and Stress

The SI unit for pressure and stress is derived from the SI unit of force and the SI unit of area.

The kilogramme force per square centimetre, widely used on the continent of Europe, is NOT an SI unit.

SI unit	Approved multiples and sub-multiples		Symbol
	Preferred	*Non-preferred*	
	giganewton per sq. metre		GN/m^2
		hectobar	hbar
	meganewton per sq. metre		MN/m^2
		bar	bar
	kilonewton per sq. metre		kN/m^2
		millibar	mbar
newton per sq. metre			N/m^2

The SI unit N/m^2 is of very small value and will only be used for very low pressures.

For stress work on solid materials kN/m^2 or MN/m^2 will be used.

For pipeline pressures either the kN/m^2 or the bar will be used according to the pressure range involved and the particular application. **It should be noted that the bar is a non-preferred unit.**

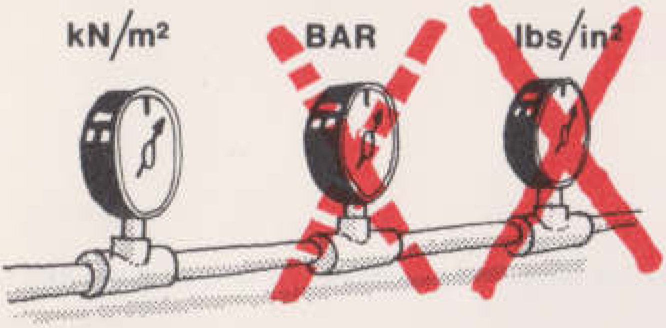
$1\ N/m^2 \times 100 = 1$ mbar
$1\ N/m^2 \times 1000 = 1\ kN/m^2$
$1\ kN/m^2 \times 100 = 1$ bar
$1\ kN/m^2 \times 1000 = 1\ MN/m^2$
$1\ MN/m^2 \times 10 = 1$ hbar
$1\ MN/m^2 \times 1000 = 1\ GN/m^2$

Equivalents

1 bar $=$ 14·504 lbs f/in^2 1 lb f/in^2 $=$ 0·069 bar
1 kN/m^2 $=$ 0·145 lbs f/in^2 1 lb f/in^2 $=$ 6·895 kN/m^2
1 MN/m^2 $=$ 145·038 lbs f/in^2 1 ton f/in^2 $=$ 15·444 MN/m^2

The bar has found favour in France and Germany because of its nearness to kg f/cm^2

1 kg f/cm^2 $=$ 0·9807 bar

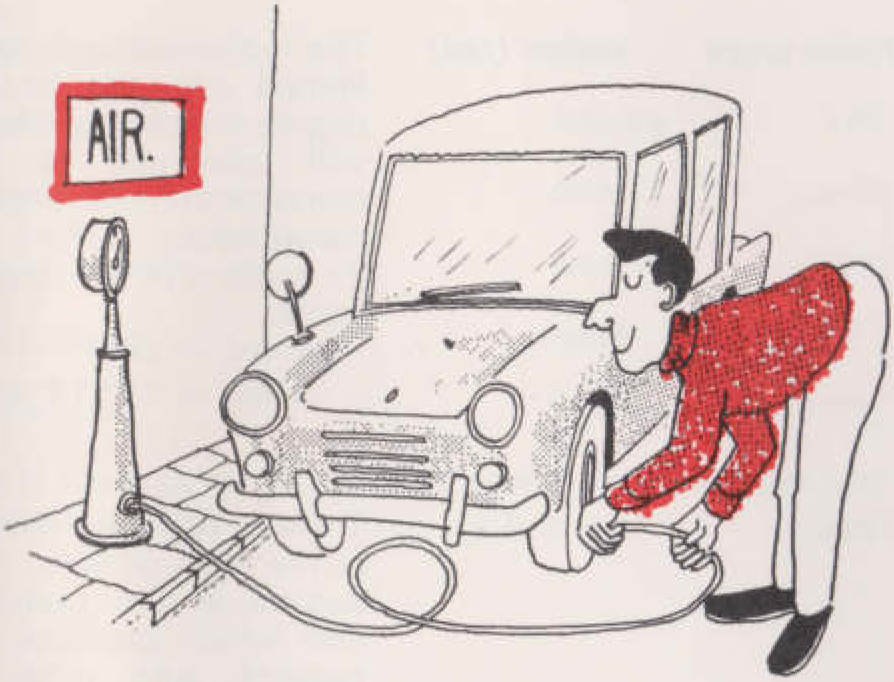


Pressure and Stress

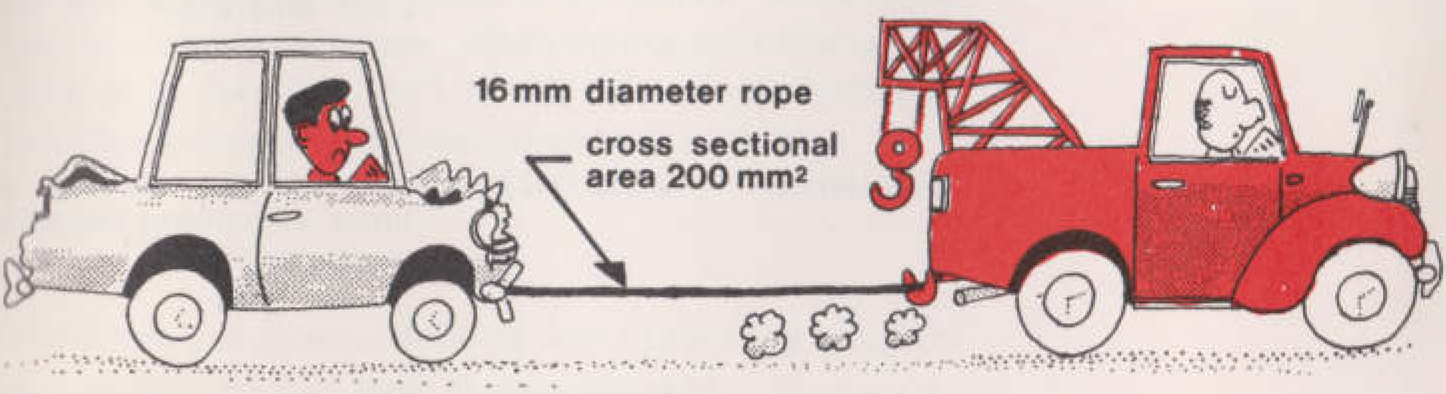
The SI unit for pressure is the newton per square metre (N/m^2).

This is so small that it can be represented approximately by the pressure exerted by a single sheet of newsprint on a horizontal surface.
Practical pressures in pipelines will be either kN/m^2 or BAR not lbs/in^2 depending upon the pressure range and the particular application.

TYRE PRESSURES will probably be measured in kilonewton per square metre to give suitable numerical values.



The SI unit for stress is also the newton per square metre (N/m^2).



Towing vehicle pulling with a force of 250N.

In the example above the stress in the tow rope is found by dividing the pulling force (in newtons) by the cross sectional area of the rope (in square metres).

i.e.,

200 mm² is expressed as $200\ (10^{-3}\ m)^2$,

$= 200 \times 10^{-6}\ m^2$

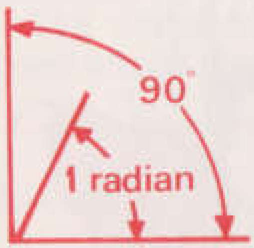
$$\text{Stress} = \frac{250}{200 \times 10^{-6}}$$

$= 1{\cdot}25 \times 10^6\ N/m^2$, or $1{\cdot}25\ MN/m^2$

The advantage of a coherent system is illustrated by this calculation. Using SI units throughout ensures the result being in the appropriate unit.

Some other SI Units

	SI unit	
Plane angle	radian (rad)	The radian will only have limited use, the familiar degree, minute and second will continue as the common units for angular measurement. There are 2π radians in a complete circle. 2π rad = 360° 1 rad = 57° 17′ 45″
Time	second(s)	There is to be no change in the units of time. The second is the preferred unit which provides coherence with other SI units. Hours and minutes will be used where seconds are not appropriate.
Frequency	hertz (Hz)	This is the number of times something happens in one second.
Rotational frequency	revolutions per second (rps)	This applies to rotating bodies. The more common unit will be revolutions per minute (rpm).
Density	kilogrammes per cubic metre (kg/m^3)	This is mass per unit volume of a substance, i.e. density of water = 1000 kg/m^3 steel = 7840 kg/m^3



Some Electrical Units

There is no change in the following electrical units:

	SI unit	
Electric potential	volt	(V)
Electric current	ampere	(A)
Electric resistance	ohm	(Ω)
Electric power	watt	(W)*
Capacitance	farad	(F)
Inductance	henry	(H)

*In SI the watt is the unit of all power, electrical, mechanical and thermal.

Packaging

An extension of the metric system is the adoption of 10 as the unit of packaging in place of the dozen. Some items are already packed in tens. When the currency changes to decimal in February 1971 it will be a simple matter to calculate prices of items packed and priced in tens.

The dozen and gross will still be with us for some products as it is often easier to pack items in this way.

Metric Paper Sizes

Traditional paper sizes such as are known in offices as quarto, octavo and foolscap will be gradually giving way to new sizes based on the "A" metric series. Some offices already use A4, A5 and 2/3 A4.

These metric sizes are based on the AO sheet measuring 841 mm x 1189 mm and having an area of 1 square metre. The apparently odd ratio of the length and width is one which is maintained when the sheet is divided into two. Therefore each successive sheet size is half the size of the previous one and has the same proportion.

Common Metric Sizes

A3	297 mm x 420 mm
A4	210 mm x 297 mm
2/3 A4	210 mm x 198 mm
A5	148 mm x 210 mm

Traditional Sizes*

"Brief"	330 mm x 406 mm
"Foolscap"	330 mm x 203 mm
"Quarto"	254 mm x 203 mm
"Octavo"	203 mm x 127 mm

*These have been given their popular names which are not technically correct.

Metric Envelopes

The change in paper sizes has necessitated a new range of envelopes and the recommended sizes for general use are C6 (114 mm x 162 mm) and DL (110 mm x 220 mm).

Other sizes are included in the standard series but they do not come within the POP (Post Office Preferred) range and will in due course be subject to higher postal rates.